In re Patent Application of:
DOUGHERTY ET AL
Serial No. **10/629,143**
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IN THE CLAIMS

1. (currently amended) A planar optical waveguide tap, in which polarization-dependent loss is substantially compensated from an input end to an output end, comprising:

a first optical waveguide for supporting a first polarization mode and a second polarization mode when light is launched into the input end of said waveguide;

a second optical waveguide having at least a coupling portion adjacent and proximate to the first optical waveguide for receiving a portion of light launched into the first optical waveguide into the second optical waveguide, said coupling portion coupling light in a first, substantially polarization-dependent manner, such that the first polarization mode couples significantly more strongly than the second polarization mode into the second optical waveguide from the first optical waveguide, so that light of the second polarization received into the second optical waveguide from the first optical waveguide experiences higher optical loss through said coupling portion than light of said first polarization mode; and,

a bend portion of the second optical waveguide distinct from the coupling portion and positioned between the coupling portion and the output end, said bend portion having at least one predetermined bend therein ~~for transmitting light therethrough~~ having a prescribed size and shape that are effective to cause light to be transmitted through said band portion in a second substantially polarization-dependent manner, that is opposite to the said first, substantially polarization-dependent manner, so that the second polarization mode couples through said band portion significantly more strongly than the first polarization, whereby light of the first polarization mode radiates out of the bend portion of the waveguide into a cladding about the bend portion with greater efficiency, and therefore experiences higher optical loss in the bend, than light of the second polarization

mode, so as to substantially compensate for a polarization-dependent loss that occurs from the coupling portion, for light which remains with the second optical waveguide after passing through the bend portion.

2. (currently amended) A planar optical waveguide system, including a first optical waveguide for supporting a first polarization mode and a second polarization mode and having a second optical waveguide including at least a coupling portion adjacent and proximate to the first optical waveguide for tapping a portion of light launched into the first optical waveguide into the second optical waveguide, ~~wherein in operation,~~ in a first, substantially polarization-dependent manner, such that the first polarization mode of the light that has coupled into the second optical waveguide from the first optical waveguide experiences [[an]]a first insertion loss I_{11}, substantially less than [[the]]a second insertion loss, I_{12}, of light in the second polarization mode coupled into the second optical waveguide, ~~wherein~~ resulting in an insertion loss difference $I_A = I_{21} - I_{11}$, with $I_A > 0$, ~~exists,~~ the improvement comprising:

a portion of the second optical waveguide ~~having~~ includes at least one bend therein having a prescribed size and shape that are effective to cause light to be transmitted through said bend ~~for transmitting light therethrough~~ in a second, substantially polarization-dependent manner, that is opposite to said first, substantially polarization-dependent manner and causes ~~a respective bend causing~~ light in the first polarization mode to undergo ~~radiate out a core of said respective bend with greater efficiency, and thereby experience~~ higher optical loss in said at least one ~~the respective~~ bend, than light in the second polarization mode, so as to substantially compensate for the insertion loss difference I_A for light coupled from the first optical waveguide to the second optical waveguide after passing through said at least one ~~respective~~ bend ~~thereof~~.

3. (currently amended) A polarization compensated planar waveguide branch comprising:

a planar optical trunk waveguide for transporting an optical signal having TE and TM modes, said planar optical trunk waveguide comprising silica disposed over a silicon substrate; and

a planar optical branch waveguide comprising silica disposed over said silicon substrate, said planar optical branch waveguide being capable of supporting TE and TM modes, and being optically coupled to the trunk waveguide, such that at least a portion of an optical signal propagating within the trunk waveguide will couple into the branch waveguide with a coupling imbalance between said TE and TM modes, causing stronger TM mode coupling than TE mode coupling, and thereby higher optical loss for the TE mode than for the TM mode, for the at least the portion of the optical signal which couples into the branch waveguide from the trunk waveguide;

wherein a portion of said branch waveguide downstream from a region where coupling takes place between the trunk and branch waveguides, or a waveguide portion optically coupled thereto for receiving the at least a portion of the optical signal, has a predetermined bend with a predetermined radius from 2 mm to 3 mm having a prescribed size and shape that are effective to cause light to be transmitted through said bend ~~for transmitting light therethrough~~ in a substantially polarization-dependent manner, that is opposite to said coupling imbalance for the at least the portion of the optical signal which couples into the branch waveguide from the trunk waveguide, and causes ~~so as to cause~~ higher optical loss in the predetermined bend for the TM mode than for the TE mode, thereby compensating for said coupling imbalance between said TE and TM modes.

4. (currently amended) In a chip for transporting a plurality of optical signals having a plurality of separate trunk waveguides within a common substrate, each having a branch waveguide optically coupled thereto by a separate coupling regions, each coupling region exhibiting an imbalance in TE and TM mode coupling, thereby inducing a polarization-dependent loss for light coupled from each trunk to a respective branch waveguide, the improvement comprising:

each branch waveguide includes a waveguide region that is downstream from said coupling region, said waveguide region having at least a predetermined bend therein, having a prescribed size and shape that are effective to cause light to be transmitted through said bend ~~for transmitting light therethrough~~ in a substantially polarization-dependent manner, that is opposite said imbalance n TE and TM mode coupling, and offsets and compensates ~~and offsetting and compensating~~ for said imbalance in TE and TM mode coupling, to realize light transmission from said trunk waveguide to said branch waveguide passing through said bend with a substantially reduced resultant or net polarization-dependent loss.

5. (new) The planar optical waveguide tap according to claim 1, wherein said planar optical waveguide tap is comprised of optical materials having mismatched thermal expansion coefficients.

6. (new) The planar optical waveguide tap according to claim 5, wherein said optical waveguide tap is comprised of silica disposed over a silicon substrate.

7. (new) The planar optical waveguide tap according to claim 6, wherein said at least one predetermined bend has a radius of curvature of 2 mm to 3mm.

8. (new) The improvement according to claim 4, wherein said chip comprises silica on a silicon substrate, and wherein said predetermined bend has a pre-determined bend radius of 2mm to 3mm.

9. (new) In a planar optical waveguide structure comprised of a first optical waveguide, having an input end into which light is launched, and supporting a first polarization and a second polarization of light passing therethrough from said input end, and a second optical waveguide having a coupling portion, that is adjacent and proximate to said first optical waveguide, and couples a portion of light passing through said first optical waveguide into said second optical waveguide in a first, substantially polarization-dependent manner, that causes light of said first polarization to be coupled more strongly into said second optical

waveguide than light of said second polarization, so that light of said second polarization undergoes higher optical loss through said coupling portion than light of said first polarization, a method of compensating for said higher optical loss in said coupling portion of said second optical waveguide comprising the steps of:

(a) providing an optical waveguide bend of a prescribed size and shape that are effective to cause light to be transmitted through said optical waveguide bend in a second, substantially polarization-dependent manner, that is opposite to said first, substantially polarization-dependent manner, so that light of said second polarization couples more strongly through said optical waveguide bend than light of said first polarization, whereby light of said first polarization undergoes higher optical loss through said optical waveguide bend than light of said second polarization; and

(b) coupling said optical waveguide bend with said second optical waveguide downstream of said coupling portion thereof, so as to cause light of said second polarization, that has been coupled from said first optical waveguide through said coupling portion of said second optical waveguide with higher optical loss than light of said first polarization, is coupled through said optical waveguide bend with lower optical loss than light of said first polarization, whereby light exiting said optical waveguide bend has said first, substantially polarization-dependent loss of said optical coupling portion compensated by said second, substantially polarization-dependent loss of said optical waveguide bend.